

REMARKS

Claims 1-18 are all the claims pending in the application.

Claims 10-17 are withdrawn from consideration.

Claims 1-9 and 18 are rejected.

Claims 1-9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2000-000447.

The Applicants traverse the rejections and request reconsideration

Claim Rejections Under 35 U.S.C. 103(a)

Rejection of Claims 1-9 and 18 as being unpatentable over JP '447

The claims have been rejected as being obvious over JP '447. In the previous response the Applicants argued that JP '447 relates merely to mixing water and gas and is not related to generation of gas hydrates. In responding to the Applicants arguments, the Examiner contends that even the Applicants claims require mixing gas and water and refers to step 1 of claim 1 where ultrafine bubbles are generated in aqueous solution.

The Applicants respectfully submit that the Examiner is believed to be incorrect in his understanding of the requirements for establishing obviousness. The Examiner is required to show that the invention as a whole, including each step in the claim, is suggested in the combined teachings of the cited references. In his counter arguments, the Examiner appears to

be indicating that a step suggested by the prior art is also performed by the invention. However, this is believed to be the reverse of what the Examiner is required to establish.

In other words, the Examiner has not shown where the step of spontaneously generating hydrate nuclei by self-compression and collapsing of the ultrafine bubbles is suggested by the combined teachings of the cited references. In paragraph 5 of the Office Action, the Examiner states generally that when a critical number of bubbles are attracted to the ultrafine bubbles, the bubbles will collapse. The Applications respectfully submit that JP '447 has no suggestion on bubbles collapsing. The Examiner is requested to provide support for this teaching.

JP '447 simply discusses how to generate micro bubbles. It discloses that by regulating vortex inside the device, gas drawn thereinto is sheared by shearing force and then forms into micro bubbles. The Applicants respectfully submit that Hydrate nuclei cannot be generated through this process of micro bubble generation. If hydrate nuclei (in the solid state) were generated under such circumstances, in fact it will significantly impeded the generation of further micro bubbles because the shearing force of the vortex is affected significantly.

The Examiner then refers to Rogers (US 6,389,820) where it is allegedly suggested that water and gas diffuse to cause hydrate growth. However, while Rogers refers to general conventional techniques and phenomenon of generating gas hydrates, there is no suggestion related to at least the step of generating hydrated nuclei by self-compression and collapsing of the ultrafine bubbles as in the present invention.

A goal of the present invention is to significantly promote hydrated nuclei generation utilizing the self pressurization effect of micro bubbles. The effect also promotes dissolution of the gas, allowing the amount of waste gas (gas failed to be drawn into water and escaped through water surface) to be very small. Consequently, the pressure regulation of the hydrate manufacturing system is easily operated, that is a great importance when the present invention is put into practical use.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. MPEP 2143 citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

It is clear that the teachings of JP '447 and other general teachings allegedly known to skilled artisans do not suggest all the claim limitations. Specifically the teachings do not suggest the step of generating hydrate nuclei by self-compression and collapsing of the ultrafine bubbles. Since the "all limitations" prong of the three prong test fails, the Examiner has not established *prima facie* obviousness.

Further, the standard for determining whether a patent claiming a combination of prior art elements would have been obvious focuses on “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *KSR International Co. v. Teleflex Inc.*, 127, S.Ct. 1727 (2007). The Applicants respectfully submit that it is not predictable to generate hydrated nuclei based on the suggestions of JP ‘447.

Claim 18 includes limitations analogous to the ones described above in relation to claim 1. Therefore, it should be patentable at least for analogous reasons.

Claims 4-6 and 8 are dependent on claim 1 and are allowable at least for the same reasons.

Further, claim 5 recites a **higher than 1 atm pressure**. A skilled artisan would know that in order to generate a hydrate, temperature, pressure and other elements must be configured for a specific gas type. Importantly, the pressure needs to be configured. Hydrates can be stabilized under 1 atm pressure only for special types of gases. Even in such cases, it is of very little practical value. From a practical standpoint, it is important that microbubbles are generated at a higher than 1 atm pressure.

However, JP ‘447 has no teaching related to generating microbubbles under these pressure conditions. Still further, even under such a pressure condition hydrated nuclei will never be generated if it is also the conditions under which the gas is sheared into micro bubbles by the shearing force of the vortex. This is at least because, strong water flow caused by the



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shearing force interferes the self-assembly that occurs during the process of hydrated nuclei generation.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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